THE PENNY MAGAZINE

OF THE

Society for the Diffusion of Useful Knowledge.

381.] PUBLISHED EVERY SATURDAY. [MARCH 10, 1838.

TRUFFLE-HUNTER.

[Sussex Truffle-Hunter, from an original Sketch.]

THE common Truffle is a sort of fungus growing entirely under ground; it is sometimes called the *ground mushroom*. There are several kinds, but the eatable one, of which we shall give some account, is the most remarkable. Its form is irregular, roundish, or oblong, in some degree like an ill-shaped potato, varying in size from that of a hazel-nut to the bigness of a moderate sized fist; the outside is black, dark-grey, or brown, covered over with a thick hard wart-like skin; the inside flesh firm, rather soapy to the feel, and has a netted cellular veiny appearance, of a light brown, or dirty white colour clouded with grey. Before the truffle is ripe it has merely an earthy smell, but on becoming mature it diffuses a peculiar odour, very pleasant to many.

The truffle is rare in most countries; and is much sought after as an article of luxury, it being used in the more expensive and luxurious kinds of cookery to give a flavour to sauces; it is also much used in meat or quince pies; and a turkey stuffed with truffles, and allowed to hang for some time, so that the flavour may be dispersed throughout the meat, is considered one of the greatest delicacies of the French kitchen. The truffles are also eaten plain boiled, or roasted, or boiled in gravy, with oil, salt, and pepper, as a sauce.

The truffle grows in most parts of the globe, Linnæus found them in Lapland and Kœmpfer in Japan. They are however principally found in the temperate countries of Europe; in England, Spain, Italy, and in France, especially the southern parts, and in the north and south of Germany; and both the rich goose-liver pies of Strasburg and the red-legged partridge pies of the south of France derive much of their exquisite flavour from being plentifully seasoned with the fresh truffle. They have been considered a luxury in all times. Pliny, Martial, and Juvenal notice them; and both Apicius and Athenæus give an estimate of their merits in antient cookery.

The truffle is usually found under trees in open forest-grounds, and in plantations of deciduous trees. In Germany it is stated that they are more generally found under or near the oak and the white-thorn. In England it is supposed that they are usually found under or near beech-trees; they require, it would seem, to grow in a place shaded from the sun, and in light loamy soil. In England they are generally found in or near the chalky-ranges; they are very plentiful about Goodwood, Slindon, and Eartham, in Sussex, and near Winchester and all along the chalky parts of North Hampshire and of Wiltshire; and the impression seems to be that they are found in places where they were not previously known, where beech plantations have been made. The notion as regards the beech may be an error, and may arise from the fact that this tree usually forms part of the plantations made in the districts where the truffle is generally found: as the truffle grows entirely under ground, and, from its rarity, very few could be obtained by a chance turning up of the soil, it is therefore usually sought for by dogs trained for the purpose. When the truffle becomes ripe, which is about the end of August or beginning of September, the strong smell we have noticed is diffused.

Dogs are taught to hunt out the truffles by the odour and then to scratch them up, the usual depth being two or three inches under the surface; sometimes however they appear almost out of the ground, and at others they are as low down as six or seven inches or more. The dog which is usually selected for the purpose of training is either a poodle or a French barbet; both kinds are docile, and have a good nose; and moreover they have another merit, which is, that by not having any strong instinct for following game, they are not taken off their pursuit of the truffle on the starting of game. The education is very simple: the dog is first well taught to fetch and carry; then the thing he is taught to fetch and carry is buried in the ground, and he learns to scratch it up and bring it to his master (being always duly rewarded for his docility by a piece of bread); as his education advances real truffles are used as the subject to be fetched, and then they are buried in the earth and the dog is set to find them, the master always bearing in mind to reward him for each successful finding. The Germans, it appears, use a paste of bread flavoured with old cheese. How far this may be successful we are ignorant, no flavour of cheese that we know comes near that of the real truffle. The old man represented in the cut, who is a celebrated trainer of truffle-dogs, generally keeps a few truffles either dried or soaked in grease through the winter, thus preserving in some degree the odour, to serve for teaching the young dogs. After the dog is sufficiently acquainted with the smell of the hidden truffle so as to scratch for it, the hunter takes him out in the field, generally accompanied by a dog already trained to the search, and these are set to hunt about, under the trees and in plantations and other likely spots, to discover by the scent and scratch up the truffle. The usual practice is for the hunter to assist the dogs, when they begin to scratch, with a spud, which is shown in the cut; and as soon as the truffle is found each dog is rewarded with a piece of bread, which is better if it is flavoured by being kept in the bag with the truffles

Those proprietors who are game preservers are generally unwilling to let the truffle-hunters into their grounds, as they are sometimes tempted to change this object of search and follow other game: the old man of whom we have given a sketch was sent for to Eartham for the purpose of explaining the mode of training the dog and exhibiting the manner of hunting: his good character has obtained him permission to range through the woods and grounds of Eartham, Goodwood, and Slindon, and a considerable range of country in the neighbourhood of Chichester. The dog is not the only animal that is taught to hunt for truffles; the pig has been trained and is used occasionally in England, Germany, and Italy; but independently of the pig not being so docile and intelligent as the dog, he is very apt to eat the truffle he finds. The gourmand has many rivals for the possession of this highly esteemed delicacy; the squirrels, the wild and tame hogs, the deer, badgers, and mice, are all eager in the search after them in the woods.

The following is an extraordinary proof of the exquisite sense of smelling that the truffle-dog possesses, and is related in Daniel's 'Rural Sports:'—"In the summer of 1802, a gentleman walked with a person who is a professed truffle-hunter: his dog found in the park at Amesbury, the seat of the Duke of Queensberry, many truffles; and as he continued his hunting, the dog, to the great surprise of his owner and the gentleman who accompanied him, suddenly leaped over the hedge which surrounded that part of the park, and ran with the utmost precipitation across the field (which was a distance of at least *one hundred yards*) to a hedge opposite, where, under a beech tree, he found and brought in his mouth to his master, as the truffle-dogs are taught to do, a truffle of uncommon size, and which weighed 12 ounces and a half.

"In Italy the usual method employed for the finding of truffles, or subterraneous mushrooms, called by the Italians *Tartufali*, and in Latin *Tubera Terræ*, is by tying a cord to the hind leg of a pig and driving him, observing where he begins to root."

Truffles are to be procured in Covent Garden Market during the season, the price varying from ten to fifteen shillings per pound. They are a considerable article of export from parts of Italy and the South of France; and in order to preserve them they are usually immersed in oil and the air excluded; little however of the flavour is reserved, and the gourmand, who is compelled to have recourse to these for want of the fresh ones, is obliged to draw largely on his recollection and imagination to supply the absence of the real flavour. There are some other sorts of this fungus, one only of which however is edible; this, which is called the *white truffle*, grows about Turin and in other parts of Piedmont and near Florence; it has a very strong flavour of garlic, and is only considered as a delicacy by those to whom garlic is not disagreeable. Some of this kind are said to be formed in the Weingarten Forest in Germany. Many attempts have been made at different periods to cultivate the truffle, as is done with respect to mushrooms, by bringing into plantations or under the shade of trees earth from the places where the truffle is found wild. We are not at present able to state positively whether any of these attempts have been attended with success. It would appear, however, from a German book noticed in Loudon's 'Gardener's Magazine' for last September, that they had succeeded in this object both in Germany and in Hungary, though the author of the work does not profess to have witnessed any experiments on the subject. Although the vegetable is found in different stages of growth, hitherto no one has been able to ascertain its organs of fructification, or how it is disseminated.

The preceding account has been collected principally from Loudon's 'Magazine,' and the statement of the Old Truffle-Hunter of Sussex, of whom we have given a sketch.

SUNDAY IN THE ISLE OF PORTLAND.

[Concluded from No. 380.]

On the only Sunday which I spent in the isle, I had scarcely finished a late breakfast when the landlord of the "Portland Arms" sent to ask if I was ready for church, and whether I would "honour him" by taking a seat in the family pew. This request, so unusual in an innkeeper, was gladly accepted, and in a few minutes I was climbing Fortune's Well Hill in his company, on our way to St. George's church, two miles off, and the only one in the island. At this place, the morning service commences at half-past ten. At ten precisely, the sexton takes his post at the belfry window, and with a telescope keeps a sharp look-out for the clergyman, who lives at some distance. As soon as he appears in sight the watchman descends, and proceeds to spread the intelligence by tolling a large bell. Previously to this, the male worshippers arrive, and spend their time in loitering about the grave-stones, but the moment the tolling of the bell commences, a general bustle ensues; some make their way into the church, but the greater part take their stand at the door, or line the pathway, with a view of bowing to the clergyman as he passes. The women, meanwhile, obey the summons, and hastening to the church, arrive just in time to pay their courtesies to the preacher, who, with many kind acknowledgments of their respect, passes on to the discharge of his duties. The church is a plain structure, built in a spurious Grecian style; it was consecrated on the 29th July, 1766. George II. gave 300*l.* towards its erection, and George III. 100*l.* towards its repairs. The interior is spacious, and divided into roomy and very high-backed pews, on which the peculiar custom prevails of painting in conspicuous letters the names of the persons renting them, and the number of the seats held:—thus, "Zechariah White, Two Places;" "Abraham Winter (my landlord), Six Places." The panels of the galleries were painted with texts of Scripture. The choral department was under the control of an ill-toned organ, assisted by a clarionet and violoncello. When the people had assembled, the simplicity of their character was curiously manifested in the ease with which each one took the most convenient posture.

The service commenced by a hymn from forty girls, educated in the church Sunday-school.

The prayers followed. The responses were singularly dissonant—the prolonged sound of some two or three hundred bass voices, in which every word was solidly distinguished, for a moment startled my notions of propriety: I had forgotten my locality.

Before service, the following verses were sung with a hoarse but eloquent emphasis, which, taken in connection with the disasters peculiar to the quarrymen's trade, was to my mind singularly touching and impressive:—

"From common accidents of life
His care shall guard thee still;
From the blind strokes of chance, and foes
That lie in wait to kill."

"At home, abroad, in peace, in war,
Thy God shall thee defend;
Conduct thee, through life's pilgrimage,
Safe to thy journey's end."

After the sermon a collection was made to defray the expenses of lighting the church on winter nights;—the money was taken, not in a plate, but in a Bandana handkerchief, laid loosely over the opening of a hat.

On the close of the service, I took a walk over the island. The people were everywhere cleanly, and the females even elegantly clad. The latter wear ample gowns; the hair, without curls, simply parted over the forehead and tied up behind; and to protect the back of the neck from sun or rain, a large and variously ornamented "curtain" descends from the hinder part of the bonnet. The intervals of worship are spent in conversation; and if the day be fine, knots of from ten to twenty may be seen on the outskirts of the villages, seated or stretched on the ground, in a happy state of rest and sociality. The women keep house; and the children are sent to Sunday-schools, of which there are several. No games or drinking-bouts "fright the isle from its propriety," but a cheerful and intelligent quietude seems to reign.

There are two large and well-attended chapels at Chiswell and Fortune's Well; and many classes for religious instruction in private houses in other parts of the island. At Easton, in the centre of the island, stand the ruins of what is called the Vicar's House. The inhabitants know little about it, but have a tradition that it was a fine place, demolished in the civil wars. It was probably a monastic establishment.

The walk over the top of the island will introduce the visitor to five of its seven villages; and as they are the only peculiar objects which remain to be described, I shall with them bring my week in Portland to a close. It is hardly possible for human habitations to present, collectively, a more dreary and unsocial aspect than a Portland village. The houses of one of these townships vary from one to two hundred in number, and stand on each side of a wide, grass-grown road, full of ruts and covered with scattered stones. Not a tree or bush is to be seen; no rural sound is to be heard; the only objects before the traveller are monotonous piles of ragged stone walls, dust heaps, and bare rocks. There is, however, much that is individually interesting in these places. The houses are built to endure the local vicissitudes of the climate, and to meet the peculiar wants of the inhabitants, and are well contrived for those purposes. The walls are built of large blocks of the rougher sorts of stone, the chimneys of brick, and the roofs of broad thin slabs of stone, but sometimes of slate or tile, in which cases, to protect the roof from being lifted by the wind, the edges are bound with a treble row of stone slabs. The form of the roof is usually that of a gable, with a considerable pitch: the doors have those comfortable appendages which it is to be regretted are now totally out of fashion in poor men's houses—deep and well-seated porches, with square or angular tops; these, together with the window bars and borders, are kept neatly whitewashed, and give favourable testimony to the cleanliness of the inhabitants. Internally, the smaller houses are divided into four rooms, lined throughout with unpainted wood, and furnished with roomy cupboards, and are dry, warm, and free from vermin. The rent varies 3*l.* to 5*l.* per annum. In front of each house stands a hen-coop, built of ponderous stone blocks, a dust-hole of the same huge materials, and a cistern for rain-water, cut out of a solid block of compact freestone as large as the Belzoni sarcophagus, and requiring almost as much labour for its excavation. Indeed, the size of the masses of stone commonly used in the construction of walls, door-jambs, gate-posts, &c., fills the mind of the stranger with astonishment. I measured one used in building a hedge-wall, and found it 7 feet by 5, with a proportionate thickness.

Polite Manners of the lower Classes in Norway.—Mr. Laing, in his "Journal of a Residence in Norway," says, "I like the politeness of people towards each other in this country; the pulling off hats or caps when they meet either strangers or friends. The custom is universal: common labourers, fishermen, private soldiers salute each other with a bow, and do not merely touch the hat, but take it off. This is carefully taught to the children, and even the schoolboys bow to each other in the streets. Such a custom is not to be laughed at; it has a humanizing effect. The exterior form of good-will, although but a form, introduces a pause before any expression of ill-will or passion can be indulged. * * There is something good even in the forms of goodness; and it is not unimportant, that, though only mechanical, they should be observed by the very lowest class in their ordinary intercourse."

BARRY'S PICTURES.—II. A GRECIAN HARVEST-HOME.

[Grecian Harvest-Home.]

"These woods were first the seat of sylvan powers,
Of nymphs and fawns, and savage men who took
Their birth from trunks of trees and stubborn oak.
Nor laws they knew, nor manners, nor the care
Of labouring oxen, or the shining share;
Nor arts of gain, nor what they gain'd to spare.
Their exercise the chase; the running flood
Supplied their thirst; the trees supplied their food.
Then Saturn came, who fled the power of Jove,
Robb'd of his realms, and banish'd from above.
The men, dispersed on hills, to towns he brought,
And laws ordain'd and civil customs taught."

DRYDEN'S VIRGIL.

THE lines above express the idea which Barry had in view in the transition between his first and second pictures. The "savage men," whom he represents as the auditors of Orpheus, are now advanced an important stage in civilization; they are gathered into communities, have "laws ordained and civil customs taught," and are enjoying the fruits of their cultivation of the soil, the source of all wealth. "The warm glow of colouring," says the description, "spread over this picture, and the elegance of the figures in the more conspicuous parts of it, form a striking contrast to the first picture. The season is, as the title expresses, that of harvest; and as most of the persons represented are employed in rural sports, the evening is chosen, as the most proper time for such relaxation from the labour of the field.

"In the foreground is a double terminal figure of Sylvanus and Pan, round which young men and women are dancing to the music of a rural pipe and tabor. Behind them are oxen with a load of corn, and other characteristic marks of the season of the year. On one side of the youthful group appear the aged parents, beholding the festivity; the father with a fillet round his head, and with a staff. In the opposite corner of the picture are some rustics sitting, in drunken disorder, with the fruits of the earth and implements of husbandry near them. These are introduced as a *foil* to the dancing figures.

"The distant parts of the picture exhibit a view of a fertile cultivated country, with a farm-house, near which are men wrestling, and engaged in other manly exercises which strengthen the body; aged men are sitting and lying along, discoursing, and enjoying a view of those athletic sports in which they can no longer engage. Here are also seen the various employments of a country life, as binding corn, of tending bees: everywhere there are a number of children. A marriage procession is advancing from a distant temple; and the joy of the accompanying figures expresses the happiness arising on such occasions, the labourers even suspending their work to hail the happy pair; in short, whatever can best point out a state of happiness, simplicity, and fecundity, in which, though not attended with much *éclat*, the duty we owe to God, our neighbour, and ourselves, is *perhaps* better attended to than in any other state of life. As embellishments the artist has introduced into the picture a peacock in fine plumage, sitting on a pent house; and at the top, Ceres, Bacchus, Pan, &c., are looking down on the festivity of their votaries; behind them is a limb of the zodiac, with the signs Leo, Virgo, and Libra, which mark the season of the year."

The Greek name of Bacchus is Dionysus; and the festivals which were held in honour of him, four in number, were called Dionysia. The earliest form of idolatry was a worship of what appeared to be the animating or productive powers of nature, the sun, moon, stars, winds, and "mother elements," descending gradually, till, in the Greek ritual, the "false gods," which were worshipped, were endowed with human form and passions, and interposed their influence in all the concerns of life. Demeter, whom the Romans termed Ceres, was the re-

presentative of the earth and its productions, as her name "Mother Earth" expresses. In the Grecian mythology she is intimately associated with Dionysus, or Bacchus. "Pindar calls Dionysus the companion of Demeter; and in a cameo he is represented sitting by the goddess in a chariot drawn by male and female centaurs." Of the four annual festivals held in honour of the reputed deities, the Rural Dionysia was probably the most ancient; it was celebrated all over Attica, the other three being confined to Athens. It was a festival of the vintage, and was doubtless, in its origin, a testimony to the truth of what Paul affirmed when he was exhorting the inhabitants of Lystra to turn from 'these vanities' to the worship of that spiritual Being who created all things: 'He left not himself without witness in that He did good, and gave us rain from heaven, and fruitful seasons, filling our hearts with food and gladness.'"

It was at the celebration of these festivals that the Grecian drama originated; and we even see the rudiments of the drama in the picture, of which our woodcut is a copy. There can be no doubt that the music and dancing of the Greeks were among the chief causes that carried them forward in civilization. Even the inhabitants of Arcadia, a name which has been for two thousand years a type of rural innocence and simplicity, are stated to have been at first as rude as their cattle, men and swine living on acorns; and their own countryman, Polybius, ascribes their improvement to music.

In the description of the picture that prepossession or prejudice which fancies the agricultural life to be the most innocent and happy is put in a doubtful form: it is termed the state in which our duties are "*perhaps* better attended to than in any other state of life." This prejudice, though, like many other prejudices, it has hold of the minds of not a few, is fast melting away from our literature. It is doubtful if any future English poet will ever obtain attention, far less a reputation, by singing of shepherds and shepherdesses, and all the tranquil blessedness of a country life. Agriculture is indeed a fixing point in civilization: bring the wandering savage to settle down to the cultivation of the soil, and the foundation is laid of a nation, of wealth, or capital, and of improvement. But let that nation remain an agricultural nation, and the chance is that, so far from advancing, it will retrograde. Nations purely agricultural have never done much for the human race. Men pent up in cities, and longing to escape from that artificial and microcosmic life which is too often, but not necessarily, its characteristic, may envy the apparent quietness of the agricultural state; but they look at it from a distance, which "lends enchantment to the view."

The introduction of the deities in visible form at the top of the picture might be objected to as a prosaical effort to introduce to our notice the objects of rural worship. But we must recollect that the worship of the Greeks was anything but spiritual; it was bodily and palpable, peopling every grove, river, and fountain with living creatures, claiming the adoration of their votaries.

"The lively Grecian, in a land of hills,
Rivers, and fertile plains, and sounding shores,
Under a cope of variegated sky,
Could find commodious place for every god.
Promptly received as prodigally brought,
From the surrounding countries—at the choice
Of all adventurers. With unrivalled skill,
As nicest observation furnished hints
For studious fancy, did his hand bestow
On fluent operations a fixed shape,
Metal or stone, idolatrously served.
And yet—triumphant o'er this pompous show
Of art, this palpable array of sense,
On every side encountered; in despite
Of the gross fictions, chanted in the streets
By wandering rhapsodists; and in contempt
Of doubt and bold denials hourly urged
Amid the wrangling schools—a SPIRIT hung,
Beautiful region! o'er thy towns and farms."

WORDSWORTH.

THE TARAI.

THE Peninsula of India, in comparison with the country immediately adjoining it on the north, may be described in a general way as a vast plain, with a burning climate, where Europeans cannot expose themselves to the sun without risk of fatal consequences. The northern boundary of this torrid region is an extensive range of the highest mountains on the surface of the globe, covered in many parts with everlasting snow, rugged, barren, and desolate; and resembling, where inhabitable, the valleys of Norway, with their pine and birch forests, rather than a country so near the hot plains of Hindustan. There is no gradation of climate, as in Europe; a few days, or, with our means of travelling, a few hours, suffice to carry a traveller from the parched plain to the icy mountain, and cranberries and bilberries may be found one day by a person who, on the preceding, was gathering shaddocks and mangoes.

A long and narrow line of pestilential marsh divides the two regions; it is nowhere much above twenty miles in breadth, often a good deal narrower, and in some few places it almost disappears; but for more than seven months in the year, from the beginning of April to the middle of November, it constitutes a barrier which is not to be passed without risk of death. This region is called the Tarai, or Taryani. Bishop Heber, who traversed it late in November, was powerfully struck with its gloomy appearance as seen at a distance in the plains of Hindustan: it was, he says, "so black and level that it might seem to have been drawn with ink and a ruler." It is in fact a dismal country, overrun with jungle and giant grass, from six to ten feet in height, through which the traveller pushes his way, according to Heber, like Gulliver in the Brobdignagian corn-field. A large portion is covered with a rank poisonous-looking plant, resembling the deadly-nightshade. In some places are immense pipala trees, casting a dreary shade, and choked up with the "vile underwood" which is traversed by narrow boggy pathways. This "vale of death" is usually enveloped in a dank, hot, milk-looking vapour, which adds to the gloom; there is no ventilation, and, from the combined effects of heat and moisture, the vegetation, according to Hodgson, the British resident in Nepal, is "of so extravagantly rife an increase, that, in Oriental phrase, you may almost see and hear it grow."

In addition to the pestilential climate of this horrible region, very large tigers and even considerable numbers of lions dwell within its recesses. Lions were long supposed to be unknown in India, but, within these few years, our extended acquaintance with all parts of that country has shown that many are found in the north-western territories. In Hodgson's account of the Mammalia of Nepal he has not included the lion among the natives of the Tarai, but it is often found in its western portion, at the foot of the mountains of Kemaoon. By travellers in the Tarai, who follow the beaten paths in the day-time, little danger is to be apprehended from wild beasts. Tigers in such cases generally keep themselves close in cover, and the European sportsman, who risks his life at all seasons, with the hope of rousing the royal brute in his lair, generally finds it a difficult matter to start him. But they are found very troublesome to the people of the villages bordering on the Tarai, who, having no elephants, are deficient in means of attacking them with safety. These people are however bold enough to do so at all risks, and when a tiger has established himself near a village, the whole population readily turns out with pikes, swords, and matchlocks, to attack the formidable creature. From the superiority of their numbers they usually contrive to destroy him; but fighting on foot, and obliged to resort to entering and beating the jungle as the only means of rousing the animal, it rarely happens that a tiger hunt terminates without the loss of

one or two lives. A reward of four rupees is given by the Government for every tiger's head brought in, and the report of a lion or tiger being in the neighbourhood frequently brings in a sportsman of the military or civil service, who, if a good shot, seldom fails, from his elephant, to kill the animal with perfect safety to himself.

Besides the tiger, Mr. Hodgson enumerates many other denizens of this pestiferous valley. "It is worthy of remark," he says, "that in this pesthouse, from which all mankind flee during eight months of every twelve, constantly reside and are bred some of the mightiest quadrupeds in the world. The royal tiger, the panther, the leopard, the elephant, the arna or wild buffalo, the rhinoceros, and stags of the noblest growth, abound; and, what to our fancies is less singular, the same malarious region cherishes boa constrictors of the largest size, and other huge creatures of their kind." This statement of the constant residence of animals is at variance with what was ascertained by Bishop Heber, who says "it is a literal 'belt of death' which even the natives tremble to go near, and which, during the rains more particularly, the monkeys themselves are said to abandon." In a subsequent passage, he says, "I asked Mr. Boulderson (the collector of the district) if it were true that the monkeys forsook these woods during the unwholesome months. He answered "that not the monkeys only, but every thing which had the breath of life instinctively deserts them from the beginning of April to October. The tigers go up to the hills, the antelopes and wild hogs make incursions into the cultivated plain, and those persons, such as Dâk-bearers,* or military officers who are obliged to traverse the forest in the intervening months, agree that not so much as a bird can be heard or seen in the frightful solitude." Mr. Hodgson remarks on the extravagance of the supposition that all the elephants, rhinoceroses, &c., should quit the forests *all together;* but the fact is that Heber spoke only of the portion of the Tarai bordering on Kemaoon, which he himself crossed; this part is more deadly than that at the foot of the Nepal hills, with which Mr. Hodgson was acquainted, and is distant three hundred miles from it. Mr. Hodgson admits that tame animals of the very kinds which flourish in the Tarai, if brought there in the unhealthy season, take the malaria and die.

The villages in the vicinity of the Tarai are wretched places, low, damp, ill ventilated, and dirty: the people are ugly and miserable; they have large heads, and very prominent ears, flat noses, tumid bellies, slender limbs, and sallow complexions; their only garment is a blanket of black wool. Dry and elevated dwellings, for which materials are plenty in the neighbourhood, with more abundant clothing, would go far to secure them better health and a more comfortable existence; but the annual fever to which they are liable seems to destroy the energy required for such undertakings, though it does not prevent the deadly feuds which are but too common among the armed population of Northern India. These people are more liable to the malaria fever, and they suffer more from its influence than Europeans do; no doubt in consequence of their lower habits of living. Their pulse is always feeble, and on the first attack of disease they sink at once into despondency. To this must be added their carelessness. In this respect all Indians are like children; and a European who takes an escort with him is often obliged to be on the alert to prevent his guards from sleeping on the ground in the open air, in situations where a night's exposure is almost certain death. Tents and raised bedsteads, warm clothing, good living, port wine, &c., are usually found sufficient safeguards; the musquito curtain is also of great utility, and is believed in India to be impenetrable to malaria.

The Tarai is not wholly useless to the people who dwell upon its borders. Every year, as soon as the malaria begins to diminish, the herdsmen set fire to the thick jungle, which clears the forest, and admits a free circulation of air: this process contributes as much as the change of weather to the comparative healthiness of the country at that season. The fire is occasionally dangerous to those who traverse the forest at this time, and travellers have suffered from it; but the general effect is very agreeable, and when the young grass is sprung up, and the scorched trees have resumed their leaves, a journey across some parts of the Tarai is picturesque and pleasant. Thousands of cows and buffaloes are then depastured upon the luxuriant herbage, which springs up so rapidly that in many places it is impossible to keep cattle upon it above two months: the luxuriant vegetation soon restores to these temporary pastures the features of the surrounding wilderness. At the same time the people of the hills come down to cultivate some of the drier spots of the forest with wheat and barley; this they reap early in April, and carry back to their own mountains, where they arrive in time to gather in their own later crops, which they had sown before their departure for the plains.

It would appear that the Tarai is not utterly irreclaimable, but that much may be done to reduce its insalubrity. On the eastern side it is certainly better under the Nepalese government than it was when under the dominion of petty rajas, whose mutual jealousy prevented improvement: much has been reclaimed, large tracts are under cultivation, and a considerable quantity of corn is exported. At the termination of the war, in 1815, the British government retained possession of the Tarai; but it was found impracticable to maintain any authority there for one half the year, in consequence of the malignant climate, and the whole tract was given up; one portion to the Nepalese, and the rest to the king of Oude, in liquidation of the sum of two crores of rupees*, borrowed of him during the war. The western part of the forest is worse than it was thirty-five years ago. At that time it was gradually being reclaimed, every year the herdsmen were advancing deeper and deeper into its recesses, and sportsmen pitched their tents for days together in places where a single night's rest would now assuredly bring on a dangerous fever. Ruderpoor, where the deaths are now so numerous that an establishment is with great difficulty kept up there, was then a populous and thriving town. Its deterioration rose from the depopulation of the country by Meer Khan, who laid waste the whole tract in 1805. This blow it has never recovered; and the mildness of the present Government has taken away a powerful motive for emigrating to such unwholesome countries; the poor native no longer finds it expedient to fly from his home to places where the oppressor is afraid to follow, but remains where he may best enjoy life, and cultivate his little patrimony in peace.

* Letter-carriers.

DOMESTIC CHEMISTRY.—V.

Boiling.

When we place a vessel of water on the fire, the substance of the vessel acts as a conductor by which the heat given off by the fire enters into the water and combines with it. What is the nature of this combination we know not: it has been supposed that the heat forms a kind of atmosphere round each particle of water, by which the particles are removed rather farther apart than they were before. Whether this be the case or not, it is quite plain that the particles of water do become more distant one from another as more heat is added, for if we take 22 pints of water, at a temperature of 32°, and heat it up to the boiling temperature, 212°, we shall find that it will have become 23 pints, on account of the expansion occasioned by the entrance of heat.

The lowest temperature at which water will remain liquid, under ordinary circumstances, is 32° Fahr., and

* Nearly two millions sterling.

the highest is 212°. It is supposed that below a temperature of 32°, the quantity of heat between the particles of water is so small that they are enabled to exert a natural tendency to adhere together, by certain surfaces or sides in preference to others, by which they become rigid and fixed in the crystalline form of ice. The extinction of the liquid form at a temperature higher than 212° is however due to a very different cause:—heat is of a repulsive nature, by which is meant that any portion of heat repels those portions which surround it: now when water is heated to 212° the quantity of heat mixed or combined with it is so great, that the liquid particles can no longer retain their position with regard to one another, but expand in the form of steam, which we may consider to be particles of water surrounded by large atmospheres of heat. So extensive is this enlargement that a cubic inch of water becomes very nearly a cubic foot of steam.

The temperature of 212° is constant for these effects only when the surrounding atmosphere is constant. The barometer proves that the atmosphere presses on all bodies at the earth's surface with a force of about 14 pounds on every square inch of the surface of such bodies; and as the water in a vessel is exposed to the air, it is, like other bodies, exposed to this pressure, and the tendency of this pressure is to retard the formation of steam at the surface of the heated liquid. There is always a considerable amount of steam in the atmosphere, and as steam and all other vapours resemble gases in the property of repelling vapours or gases of their own kind, the steam already existing in the atmosphere resists the formation and ascent of more steam from the surface of the water. When however the water attains a temperature of 212°, the force which the steam possesses overcomes the resistance of the steam existing in the atmosphere, and new steam is formed as fast as new portions of heat enter the water. It is for this reason that water can never become hotter after it once boils: any additional heat imparted to the water does not remain in it, but goes instantly to the formation of new portions of steam, which escape from the surface.

When water is boiling, the steam which ascends from it exerts a greater a force than that which the atmosphere exerts. We may understand this by referring to a common saucepan partly filled with water and covered by a lid which fits air and water-tight. The air, we know, is pressing on the top of the cover with a force of 14 pounds on a square inch: if now the saucepan be placed on the fire, steam will gradually rise from the water and fill the upper part of the vessel: as the water becomes hotter more steam ascends, but as the latter cannot escape, it must mingle with that already formed, by which its density is increased; at last, when the boiling temperature is attained, the steam has become so much condensed, and its elastic force so much increased, that if the lid be not removed the vessel will burst. The tremulous motion which we frequently see in the lid of a saucepan or tea-kettle, when the water is boiling and the lid is not quite closed, is occasioned by the energy with which the confined steam tends to escape. The whole principle of the earlier steam-engines depended upon the single fact, that one side of a piston was pressed by the external atmosphere, and the other side was pressed by steam above the boiling temperature: the latter being the stronger pressure of the two, the piston was forced to move outward, and could not return until the steam was condensed, and thus left the external air to press unresisted.

If then the atmosphere determines at what temperature water will boil, it may be asked, what would occur if there were no atmosphere? This has been answered by a pleasing experiment with the air-pump,—an instrument which enables us to procure a space almost entirely devoid of air: in this space water has been found to boil at a temperature of about 80°, which is not nearly so high as summer temperature in some parts of the world,—in fact, were it not for the pressure of the atmosphere, the water of lakes, &c., near the tropics would frequently boil: there is neither air nor steam to resist the formation of steam from the water in the air-pump, so that the bursting or elastic pressure of the newly formed steam is not required to be so great as when steam already exists over the surface of the water. It is desirable here to state, that the resistance to the formation of steam was formerly referred to the air itself, but it is now supposed to be due to the steam already existing in the air.

It will naturally be supposed, as water influenced by the atmosphere does not boil until it has attained 212°, and that it will boil at about 80° in a vacuum,—that it will boil at intermediate temperatures in air more or less rarefied:—such is the fact. When the air is partially rarefied by the air-pump, water will boil in it at a temperature between 80° and 212°, according to the degree of rarefaction. As we ascend from the surface of the earth, the air becomes less dense, because there is a less quantity of air pressing on it from above; and as its density and pressure decrease in the same degree, it follows that water and other bodies are less pressed by the air in higher than in lower regions, so that water will boil at a lower temperature than 212°. Thus, at Mexico, which is 7000 feet above the level of the sea, water will boil at a temperature of 200°; and at the summit of Mont Blanc (about 15,000 feet) at 184°; simply because the air is more rarefied than at a lower level: again, at the bottom of deep mines, the boiling temperature is rather more than 212°, on account of the increase in the density of the air.

Such then being the nature of boiling, we will shortly consider the effect of boiling on our food; but first it will be convenient to take a rapid view of the chemical nature of animal and vegetable diet.

All the articles of our food are derived from the animal and vegetable kingdoms, and it is an extraordinary fact that the ultimate elements of all these may be reduced to four, viz., carbon, hydrogen, oxygen, and nitrogen. Here then we have indeed a brief alphabet for so comprehensive a history as is presented to us by the organic creation; but it is nevertheless true, and the reason of the infinite variety in animal and vegetable substances is to be found in the fact that the above elements, two or more, combine in different proportions, or are arranged among themselves in different modes. Such substances may be comprised in four classes, as follows:—

1. Substances composed of carbon, hydrogen, and oxygen,—the two latter being in the proportion to form water. These are sometimes called hydrates of carbon:—gum, sugar, starch, and woody fibre, are examples. 2. Substances composed of the same elements as last-mentioned, but compared with which the hydrogen is in excess: fats, oils, resins, and other very combustible bodies are examples. 3. Bodies in which the oxygen is in excess, such as the greater number of vegetable acids. 4. Substances composed of carbon, oxygen, hydrogen, and nitrogen: this class includes many animal and a few vegetable substances; as examples we may instance albumen, of which the white of an egg is a good specimen; gluten;* and gelatine, of which isinglass, which consists of the dried sounds or air-bladders of the sturgeon, is a specimen.

We have said that carbon, hydrogen, oxygen, and nitrogen are the *ultimate* elements of organic bodies: this term requires some explanation. When a substance composed of two compound bodies is presented to the chemist for analysis, and he states the elements existing in such substance, he names certain bodies which are not susceptible of further decomposition, or the ultimate

* In a subsequent article on Bread and Baking we shall explain the meaning and properties of gluten.

elements of the body; but if he merely separate the body into the two compound substances which compose it, he thus arrives at the *proximate* elements of the body. Chalk, for example, is composed of carbonic acid and lime, which are its *proximate* elements; but if we separate the carbonic acid into carbon and oxygen, and the lime into calcium and oxygen, of which it is formed, we obtain the *ultimate* elements of the piece of chalk, viz., calcium, oxygen, and carbon.

The proximate principles of animals which are presented to us in the form of food may all be reduced to three, viz., fat, gelatine, and albumen. These are modified in different parts of the animal, according to circumstances; and the manner in which boiling extracts these principles from meat cannot perhaps be better shown than in the preparation of mutton-broth; we will therefore consider the chemical processes which take place.

Neglecting the herbs, vegetables, &c., which are placed with the meat in the water to be boiled, and are to heighten its flavour, we select the only two articles which are really necessary in broth-making, viz., the "scrag-end of a neck of mutton" and clean cold water contained in a saucepan, the quantity of water being just sufficient to cover the meat: the scrag is chosen on account of its leanness, as fat broth is never very desirable. The meat being introduced, we must consider its several parts: they are bone, flesh, fat, skin, tendon, ligament, and membrane.

Bone contains several matters, such as cartilage, gelatine, and an earthy substance consisting principally of phosphate of lime: cartilage is commonly called gristle; gelatine is a highly nutritious substance, forming, indeed, the leading ingredient in calves'-feet jelly: the phosphate of lime is that which gives solidity to the bone, but which when separated from it is obtained in the form of a powder; this is insoluble in water, while the cartilage and gelatine dissolve by boiling.

Flesh is nothing more than the meat or muscle of an animal: if we eat a beef-steak, we eat a portion of the muscle of the ox. It is generally of a red colour, but if washed repeatedly in cold and afterwards in hot water, it becomes nearly white, in which state it is called *fibrin*, and most of the nutriment is gone. If the water in which the meat had been washed were boiled for some time, strained, and boiled again, it will be found, on cooling, in the state of jelly; it will in fact be gelatine, which we have said is one of the proximate elements of bone: the object of straining is to separate the albumen, which sets or solidifies by boiling. This latter substance, which is almost the same as white of egg, exists largely in the blood of all animals. The gelatine from the meat contains another principle and a highly important one:—this is *ozmazome*, which is the *savoury* principle of animal food, and the source of its odour and taste, and is also nutritious: it may be obtained in a separate state, when it appears as a thick liquid, like syrup, but does not gelatinize nor coagulate like gelatine and albumen. From what has been said, it will be seen how improper it is to wash meat previous to cooking it:—the colour is considered to be improved, but much nutriment is thrown away in the washings. Fibrin may be partly converted into gelatine by boiling, and thus be fit for food.

The fat of animal substance is too well known to need much remark: it is remarkable as containing no nitrogen, and is very similar to animal and vegetable oils.

The remaining proximate principles of meat we may notice under one head. The muscles terminate in that silvery-white substance called *tendon*, which is nothing more than gelatine in a compact state: it is soluble by long boiling. The bones of animals are connected at the joints by *ligament*, which is a strong elastic substance consisting, like tendon, of soluble gelatine. Skin and membranes also give much gelatine by long boiling: indeed this substance is the leading ingredient in almost all animal food, and is commonly called jelly.

We see then that the important parts of an animal, considered with reference to food, are gelatine, albumen, fat, and ozmazome. When therefore we boil a piece of meat, as in the process of making broth, the fat is dissolved and separated, and floats upon the surface of the water, from which it may be skimmed off, or, if allowed to cool, it becomes a white solid. The gelatine from the different substances, muscle, tendon, &c., is dissolved, and if the quantity be sufficient, the broth will form a jelly when cold. The insoluble fibrous residue, or the boiled meat, is little more than fibrin, and contains but little nutriment.

Thus it will be understood that making broth is nothing more than obtaining certain nutritious substances existing in meat, and transferring them into the water in which they are soluble. It is usual, in making broth, to cut the meat into small pieces, so that the solvent power of the water may act more perfectly upon it. By long boiling, the muscular fibres separate, and the meat loses its nutritious qualities, which the water has acquired to a great extent:—a small portion of the fibrin and of the albumen is dissolved; the tendons, ligaments, membranes, and skin dissolve partially; the bones lose their cartilage and much of their gelatine; the albumen and blood solidify and constitute the skum which floats on the surface; and the ozmazome, which dissolves easily, and is volatile at a high temperature, constitutes in great measure the savoury steam of the kitchen, which is obtained at the expense of the provision. Simmering, or stewing, is an excellent mode of cooking meat: the temperature necessary to this process is about 150°, whereby the albumen, or fibrin, of the meat remains soft, and the soluble matters are extracted and form good broth, the residual meat is fit to be eaten, and the ozmazome, or flavour, is not driven off to so great an extent.

By boiling meat within certain limits, it becomes more firm and digestible, loses its red colour, and acquires a savoury taste and smell: a change in the state of combination ensues, whereby nutritious qualities are developed from substances which were devoid of that important property before, and many other changes are undergone. But if the boiling be continued for too long a time, the meat becomes indigestible, and loses much of its taste and smell and nutritive qualities. If the boiling be violent, the muscular portions on the outside of the meat lose their gelatine, and become tough and fibrinous, while the inside is scarcely affected. As much of the nutritive juices of meat escapes into the water in the act of boiling, the meat should not be cut into small pieces, except for the purpose of making broth or soup: in other words, if the the nutriment is required to be kept in the meat, a large joint is better than a small one, but if the water is to contain the nutriment, then it is better that the meat should be in small pieces.

Thus then we see what an important service boiling-water renders to us in preparing the flesh of animals for food. A similar train of benefits, though perhaps in a smaller degree, are derived in the preparation of vegetable diet: but we need not now enter into these: enough has been said to show that the solvent powers of boiling-water are as useful to man as are those properties of water by which it is enabled to act as a moving power to our machinery, and as a fluid surface on which our ships can float.

*** The Office of the Society for the Diffusion of Useful Knowledge is at 59, Lincoln's Inn Fields.

LONDON:—CHARLES KNIGHT & CO., 22, LUDGATE STREET.

Printed by WILLIAM CLOWES and SONS, Stamford Street.